

High Energy, Quaternary, HMZ, Vertical, or Stacked Air...? What's In A Name...? ...It's The Results That Count!

Recovery boiler upgrading for improved performance is associated with different trademarked or patented names attached to OEM and vendor technologies. But catchy name or not, ...at the end of the day, really, ...it's the results that count.

In the past fifteen years, many mills have pursued ways to achieve improved performance from their existing kraft recovery boilers, particularly in the following areas:

- Gaining additional black liquor dry solids (BLDS) burning capacity, sometimes significantly over the original MCR throughput.
- Reducing emissions of air pollutants (TRS, NO_x, SO₂, and/or particulate matter).
- Reducing carry-over, thus reducing boiler cleaning needs.
- Increasing thermal and reduction efficiencies.

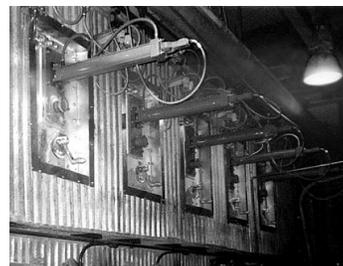
The technology to achieve these goals focuses on optimizing the delivery parameters of the black liquor fuel and combustion air. On the liquor side these parameters are: percent dry solids, liquor temperature and pressure, location and number of nozzles, nozzle type, size, and angle. On the combustion air side the variables are: number of levels and location of air supply, air temperature and pressure, number and location of air ports, and air port design factors.

Key to the success of the upgrade effort is that these parameters are optimized individually for each boiler, taking into account each boiler's unique design features, fuel characteristics, and upgrade goals.

What works for one unit may not necessarily be successful on another. Whereas there have been many successful recovery boiler capacity upgrades, we all know that this "road of upgrades" has seen its fair share of disappointments, unmet performance guarantees, and outright failures.

The combustion "principles and fundamentals" that support an upgrade technology from any vendor is identical, however, the "packaging" and implementation will be different. Most vendors, like Jansen, "bundle" their technology in a captivating name, such as the Jansen High Energy Combustion System™; others call theirs "HMZ air", vertical air", "quaternary air", or "stacked air". Some of these names, like ours, are trademarked, or the technology has been patented.

Jansen has upgraded the combustion systems of over 25 kraft recovery boilers and *some of these are among the very highest loaded recovery boilers in North America, both on the basis of cross-sectional and volumetric heat input rates.* Jansen has an excellent record for recovery boiler combustion system upgrades. All installations have met or exceeded the project's performance guarantees. Two case histories from recent installations are synopsized below:



New front and rear wall secondary air nozzles were installed on this CE Recovery Boiler (Boiler A)

BOILER A. This project was a three-level air conversion of a standard CE recovery boiler equipped with only two-levels of air and original MCR capacity of 2.6 million lb/day BLDS. *Before upgrade performance:* the unit could not exceed 3.1 million lb/day BLDS and maintain TRS below the limit of 5 ppm. *Upgrade hardware:* Computational fluid dynamics (CFD) modeling was used to design new "overbed" secondary air that was installed below the

(continued on page 2)

Bark Boiler OFA System Upgrades, An Update

Since 1998, Jansen has been awarded contracts to design/supply overfire air (OFA) system upgrades on thirty-five (35) biomass boilers in the Forest Products Industries. With these upgrades (of which several are still under contract for installation in the remainder of 2005), to the best of our knowledge, Jansen continues to supply the most biomass boiler OFA system upgrades to the industry.

A breakdown by original equipment manufacturer (OEM) shows that these OFA system upgrades were installed on nearly equal numbers of units from each Babcock & Wilcox (B&W), Combustion Engineering (CE), and Foster Wheeler (FW), with the remaining four on Erie City (2), Zurn, and Riley units. Most of Jansen's OFA upgrade projects are supplied to "repeat customers", such as International Paper, MeadWestvaco, Weyerhaeuser, and SAPPI, as these four companies have placed a combined total of twenty-seven (27) OFA upgrade orders.

(continued on page 2)

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(continued from page 1)

liquor guns (on the front and rear walls) and the old upper tangential air was retained without modifications. *Post upgrade performance:* the unit has achieved up to 3.7 million lb/day BLDS and TRS, on a monthly average, is always below 0.3 ppm (corrected for dry gas at 8% O₂). Water washes are infrequent. (The new secondary air nozzles are shown in the photo on page one).

Boiler B. This project involved an upgrade of the secondary air delivery on a standard three-level air B&W recovery boiler with original MCR capacity of 2.3 million lb/day BLDS and equipped with an OEM supplied earlier air upgrade. *Before upgrade performance:* this “short and stubby” unit could not exceed 2.8 million lb/day BLDS throughput and maintain TRS below the limit of 3 ppm. Daily, up to eight trucks of liquor were shipped off-site and the boiler was water washed every six to seven weeks. *Upgrade hardware:* After in-depth CFD modeling to optimize the combustion system, Jansen air nozzles were installed on the secondary air level (right and left sides) and liquor gun air was also installed. *Post upgrade performance:* the unit has achieved up to 3.1 million lb/day BLDS throughput capacity and TRS has been well below 2 ppm. Liquor is no longer shipped off-site and the water washing frequency has dropped to less than twice per year.

Needless to say, when selecting the best recovery boiler upgrade approach for your unit, it is important to make sure the solution fits your goals and your boiler. Catchy marketing “buzz” names are not the way to effective recovery boiler upgrades; thorough analysis of the boiler’s limits and a customized solution provide the best results!

For further information and references, please contact Arie Verloop (425.952.2825) or by e-mail: Arie.Verloop@jansenboiler.com. Additional information and specific project references can also be found in past newsletters and posted on our website at: www.jansenboiler.com. 

Bark Boiler OFA System Upgrades, An Update

(continued from page 1)

For a large number of projects, the high and rising cost of auxiliary fossil fuels (natural gas, oil, and coal) provides the economical “impetus” for the OFA delivery system upgrades. In many cases, an improvement in the boiler’s environmental performance is sought as well (i.e., Boiler MACT).

Key elements in the Jansen approach and project execution are:

- A thorough initial process evaluation is conducted to characterize the boiler and identify its individual strengths and weaknesses.
- CFD modeling is carried out early to evaluate design options and verify that the project goal(s) can be met.
- A customized, engineered solution is developed that is tailor-made for each boiler.
- Jansen uses relatively few but large Jansen High Energy Combustion Air Nozzles™ that provide excellent OFA jet penetration and mix-

ing. The Jansen nozzle efficiency provides high jet velocities without the need for excessive combustion air supply pressures. As a result, in most of our upgrades, the existing FD fan can be used to supply OFA and no new fans are needed.

- OFA is supplied at an elevation low in the furnace, just above the fuel distributor spouts. With increased burning of waste wood fuel (often supplemented by TDF), large amounts of volatiles are released from these grate fuels that are quickly mixed with air and fully burned.
- OFA nozzles are usually placed on the side walls, where there are few interferences. Therefore, the nozzles can be located to achieve the best combustion performance.
- Uncomplicated installation of OFA nozzles on the side walls is also more cost effective. Installation costs are minimized and boiler downtime can be kept within four to five days.



New side wall OFA was installed on this combination waste wood and oil fired power boiler.

- Follow-up support to assure that the boiler is operating to the owner’s satisfaction.

More specific project information can be found in previous Newsletters which can be found on our website: www.jansenboiler.com. (Note: Jansen Newsletter back issues beginning with issue No. 23, Winter 2000, are included in its entirety on the website.)

For further information and specific inquiries, please contact Arie Verloop at 425.952.2825, or Ned Dye at 425.952.2827 or by e-mail at Firstname.Lastname@jansenboiler.com. 

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Disposal of HVLC NCG in Existing Boilers

Disposal of High Volume Low Concentration (HVLC) noncondensable gas (NCG) in dedicated incinerators is expensive and can create operating and environmental problems. Furnace injection and rapid oxidation with the use of Jansen High Energy Combustion Air Nozzles has proven to be an efficient and low cost option.

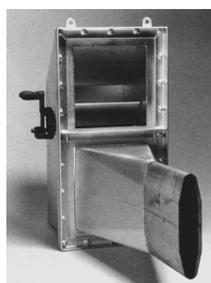
HVLC NCG, referred to as dilute noncondensable gases (DNCG) are collected in a pulp mill from various sources including brownstock washers and deckers, chip bins, digesters, blow tanks and accumulators, filtrate tanks, black liquor tanks, sewers, oxidizers, and many others. DNCG can conveniently be combined into one gas header for treatment. Gas coolers and preheaters can be used to condition the DNCG prior to incineration. DNCG quantities are usually 10,000 to 30,000 acf per ton of pulp (15,000 to 30,000 m³/tonne), with TRS concentrations on the order of 50 to 250 ppm and combustibles, such as methanol, on the order of 2,000 ppm. Moist air makes up over 95% of the DNCG. This is perfectly suited for mixing with boiler combustion air.

Injection of DNCG Into Boilers With Jansen Air Nozzles

There are several ways of disposing DNCG and the preferred methods vary from mill to mill. One method of DNCG disposal that has proved successful in several mills is injecting them into an existing boiler, either separately or pre-mixed with combustion air. Jansen High Energy Combustion Air Nozzles are a proven method for DNCG disposal with minimum disruption to normal operation. Jansen High Energy Combustion Air Nozzles have been used since 1986 in over 55 recovery and power boiler applications to improve the combustion and increase fuel burning capacity. These patented nozzles are characterized by a design that efficiently converts static pressure in the windbox into high air velocity (kinetic energy) leaving the nozzle tip.

Jansen Air Nozzles Achieve:

1. High air/DNCG mixture jet velocity at nozzle tip
2. Deep jet penetration inside the furnace cavity
3. Turbulent mixing of combustion air with combustibles at high temperature
4. Rapid oxidation of combustible materials including DNCG compounds
5. Clean flue gas conditions at the furnace outlet
6. Low TRS, CO, VOC, and SO₂ emissions
7. Easy shut-off capability of the DNCG without interfering with boiler operation
8. No/low maintenance nozzles. DNCG have been disposed of in this manner for many years. The technology and long-term experience is available today.
9. Air/DNCG flow measuring capability



Jansen High Energy Combustion Air Nozzle



Cluster rule legislation requires kraft pulp mills to collect and incinerate HVLC NCGs.



Individual air and HVLC NCG supply piping, shut-off valves, expansion joints, and injection nozzles can be seen at the tertiary air level of this recovery boiler.

Benefits of Disposing DNCG in Existing Boilers

- Low capital cost – no new incinerator equipment to purchase
- Easy to install
- Low operating cost – no additional fossil fuels are needed to oxidize the DNCG
- No detrimental effect on mill production and operating targets
- BLRBAC has developed recommended good practices to burn DNCG in recovery boilers
- Recovery of sulfur if incinerated in recovery boiler

In recent years, Jansen has supplied several recovery and biomass boiler overfire air system upgrades with the purpose to facilitate HVLC NCG incineration. A photo of a recent west coast installation is shown.

For further information please contact Arie Verloop at 425.952.2825, or John La Fond at 425.952.2832 or by e-mail: Firstname.Lastname@jansenboiler.com. Additional information and specific project references can also be found on our website at: www.jansenboiler.com.

(continued on page 4 with a table of installations)

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Disposal of HVLC NCG in Existing Boilers *(continued from page 3)*

Jansen Installations in use today

Mill	Boiler Fuel	HVLC NCG Quantity		HVLC NCG Injection	
		lb/hr	acfm	Location	Method
Mill A	Waste Wood, Fines, Oil	47,580	13,700	Overfire Air ("Global")	Jansen Nozzles
Mill B	Waste Wood, Sludge, Coal	28,900	10,000	Overfire Air ("Global")	Jansen Nozzles
Mill C	Waste Wood, Oil	63,225	18,200	Overfire Air ("Global")	Jansen Nozzles
Mill D	Waste Wood	54,600	13,000	Two Dedicated Nozzles @ Level of OFA	Jansen Nozzles
Mill E	Waste Wood	45,000	14,000	Two Dedicated Nozzles @ Level of OFA (2 Units)	Jansen Nozzles
Mill F	Black Liquor	Up to 100,000	Up to 27,000	Secondary & Tertiary Air ("Global")	Jansen Nozzles
Mill G	Black Liquor	71,000	20,000	Secondary Air ("Global")	Jansen Nozzles
Mill H	Black Liquor	47,810	13,270	Tertiary Air ("Individual")	Jansen Nozzles
Mill I	Waste Wood	84,000	23,640	Two Dedicated Nozzles @ Level of OFA (2 Units)	Jansen Nozzles

New Direct Dial Phone Numbers at Jansen

Jansen Combustion and Boiler Technologies, Inc. has upgraded its telecommunications hardware and software systems.

In addition to being able to call our current main phone number (as before: 425.825.0500), as part of this new system, every Jansen employee now has their own personal direct phone number. If you call the main number, option 7 will give you the extension number of the employee you are looking for.

Or feel free to call Cathy (425.952.2835) or Pat (425.952.2843) to get the complete direct number of the person whom you wish to speak to.

Our fax number did not change (425.825.1131). 

Upcoming 30th Anniversary Celebration!

On January 16, 2006, Jansen Combustion and Boiler Technologies, Inc. will be celebrating their 30th Anniversary.

There will be a special edition of our Newsletter in the Fall/Winter of 2005/2006 in recognition of this special upcoming milestone. We will also be having an Open House on Friday, January 13, so if you are in the area please feel free to stop in. More details will be forthcoming. 

Receive Our Newsletter by E-mail

This Newsletter, No. 32 Summer 2005, is again being sent by e-mail to our contacts of whom we have an e-mail address. It will also be sent via regular postal service.

We are continually expanding the electronic distribution list for our bi-annual newsletter. To receive future newsletters, you are given the following choices:

- Prefer receipt by e-mail (no regular mail)
- Prefer receipt by regular mail (no e-mail)
- Prefer both mailing (e-mail and regular mail)

If we do not hear from you, we will assume the third choice.

To receive this and upcoming Newsletters electronically, please send your e-mail address to editor@jansenboiler.com and you will be included on the list. 

Our Company provides combustion and boiler technology, products, and services.

We are dedicated to working with our clients to achieve their production, reliability, efficiency, safety, and environmental goals.

We accomplish this by:

- Listening and understanding.
- Providing a flexible approach to problem solving.
- Developing creative and innovative solutions.
- Working with clients to implement these solutions.

Our team of talented and experienced individuals is committed to the highest standards of professional ethics.

We commit ourselves to creating a challenging and supportive work environment that fosters opportunity for professional growth, fulfillment, and rewards.

Project Capabilities Waste-to-Energy Boilers

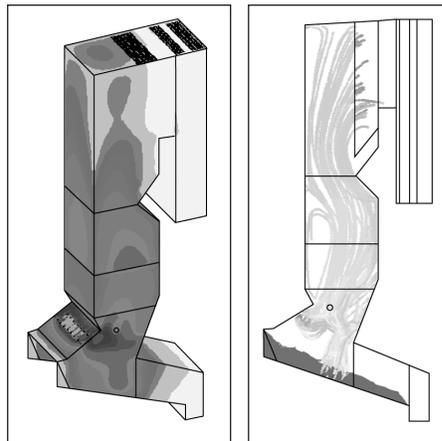
BOILERS IN WASTE-TO-ENERGY INDUSTRY

Municipal Solid Waste (MSW), Refuse Derived Fuel (RDF), Tire Derived Fuel (TDF)

Scope of Services

Jansen has completed several projects for customers in the Waste-to-Energy industry. Typical waste fuels in this industry are municipal solid waste (MSW), refuse derived fuel (RDF), and tire derived fuel (TDF). The following services were provided to this industry:

- General troubleshooting and problem root cause analyses.
- Superheater corrosion analyses and new designs.
- Feasibility studies for boiler fuel conversion (from prior fuel to MSW/RDF/TDF).
- Review of process design factors, pressure part evaluations, and circulation studies.
- Computational Fluid Dynamics (CFD) modeling of combustion performance and heat transfer characteristics.
- ASME Code “S” pressure part design (furnace, superheater, generating bank, and/or economizer).
- Pressure parts supply, fabrication, and installation.



Selected Customers

Consumat Recomp
EnergyAnswers Corporation
Exeter Energy

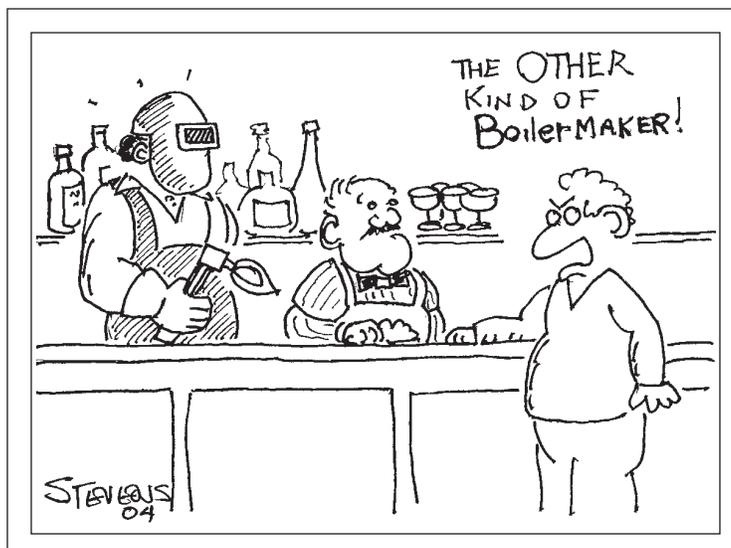
Green Island Energy Limited
Maine Energy Recovery Company
Montenay Power

The Barlow Group
Wheelabrator Energy

For further information please contact Arie Verloop at 425.952.2825, or by e-mail at Arie.Verloop@jansenboiler.com. 

Boiler House Cartoons on Jansen Website

A collection of boiler house cartoons can be viewed on our website: www.jansenboiler.com. Some 30 cartoons by Gordon Stevens shown previously in this newsletter are presented on the site. Each cartoon depicts a humorous situation with people and equipment in the boiler house. As you will agree, Gord has the rare insight to find humor in the operation of power and recovery boilers and we hope you enjoy his cartoons as much as we do.



Upcoming Bark Boiler Workshop

Continuing an annual tradition that was started by Jansen in the year 2000, we are again organizing a Bark Boiler Workshop with our co-sponsors. The purpose of the workshop is to share information with our customers about new developments and results of improving the operating performance and fuel economy of existing biomass fueled power boilers.

The workshop is scheduled to take place in Atlanta, Georgia, September 22 and 23.

The day-and-a-half workshop consists of presentations about new and proven technologies and cost effective solutions to improve the bottom line performance of bark-fired boilers, with the following goals:

1. Increase biomass (wood waste and sludge) burning capacity (sometimes also TDF)
2. Reduce reliance on fossil fuel firing
3. Increase thermal efficiency
4. Reduce carryover and unburned char
5. Improve emissions performance (CO, VOC, NOx, particulate)
6. Facilitate efficient and safe incineration of DNCG

The workshop is co-sponsored by:

- Jansen Combustion and Boiler Technologies, Inc
- Process Equipment / Barron Industries
- Emerson Atlanta Solutions Center

Participation in the workshop is by invitation and prior request only, is free of charge. Jansen reserves the right without advance notice to cancel or postpone the workshops at any time without obligation or liability.

To check availability and receive additional information, please call Cathy Thomas at 425.952.2835, or e-mail: Cathy.Thomas@jansenboiler.com. 

In This Issue:

- What's In A Name...? ...It's The Results That Count!
- An Update on OFA System Upgrades
- Project Capabilities Waste-to-Energy Boilers
- Disposal of HVLC NCG in Existing Boilers
- New Direct Dial Phone Numbers
- Upcoming 30th Anniversary Celebration
- Receive Our Newsletter By E-mail
- Bark Boiler Workshop (September in Atlanta)
- Boiler House Cartoon

Recovery & Power BOILER NEWS

Recovery & Power Boiler News is published twice a year by Jansen Combustion and Boiler Technologies, Inc. to provide information to Owners and Operators of boilers.

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